(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 822 121 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
04.02.1998 Bulletin 1998/06

(51) Int Cl.[6]: **B60R 16/02**

(21) Application number: **97401841.8**

(22) Date of filing: **31.07.1997**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV RO SI

(30) Priority: **01.08.1996 JP 203612/96**

(71) Applicant: **SUMITOMO WIRING SYSTEMS, LTD.**
Yokkaichi City Mie 510 (JP)

(72) Inventors:
- **Sakata, Tsutomu**
  Yokkaichi-City, Mie 510 (JP)
- **Kato, Takahiro**
  Yokkaichi-City, Mie 510 (JP)

(74) Representative: **Dronne, Guy et al**
Cabinet Beau de Loménie
158, rue de l'Université
75340 Paris Cédex 07 (FR)

(54) A noise-preventive grommet and a manufacturing process of the same

(57) Used in an automobile, the grommet (10) reduces noise leakage from the engine to the passenger space. It is made of rubber or an elastomer and comprises : a small tube portion (11), through which a wiring harness (W/H) is passed ; a frustoconical tube portion (12) flaring from an edge (11a) of the small tube portion (11) and comprising a flared portion, on the outer surface of which is formed a recess (12a) for fitting car body panel ; an internal tube portion (13) through which the wiring harness (W/H) is passed, the internal tube portion (13) depending from the edge (11a) of the small tube portion (11) and extending along the axial direction in the frustoconical tube portion (12) ; and a closing portion (14) connected to an edge (13a) of the internal tube portion (13) distal to the edge (11a) of the small tube portion (11) and to the flared portion.

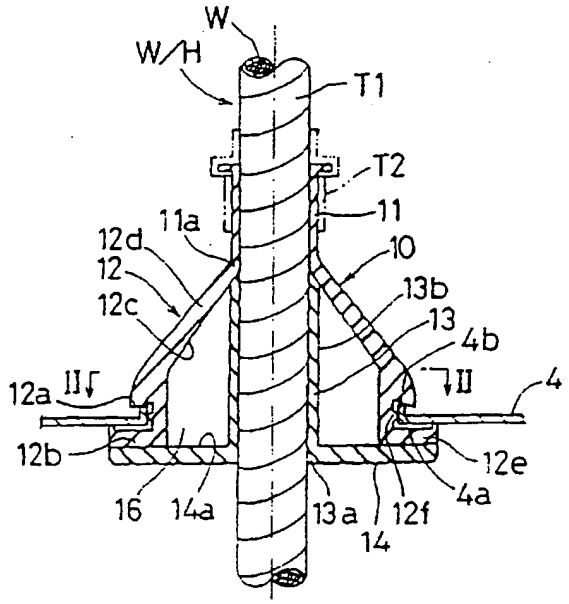

FIG.4

EP 0 822 121 A2

Printed by Jouve, 75001 PARIS (FR)

Description

The present invention relates to a grommet used in an automobile body. More particularly, the invention relates to a grommet fixed to a harness wired through a body panel which partitions an engine compartment and a passenger space. The grommet is set up at the intersection of the harness and the body panel, such that it prevents water and dust penetration from the engine compartment to the passenger space. Moreover, it improves noise insulation.

As shown in Figure 1, when a harness is wired through the body panel 4 which partitions the engine compartment X and the passenger space Y, a grommet 3 is fixed on the body panel and shields the passenger space Y from water and dust.

As shown in Figure 2, the conventional grommet 3, made of a rubber or an elastomer, is an integral piece having two portions. One is a small tube portion 1 to be fixed on the circular surface of the wiring harness. The other is a frustoconical tube portion 2 flaring therefrom.

Electrical cables W are first bundled, then a tape T1 is helically wound thereon to give a wiring harness. The harness is passed through the grommet 3 and is fixed by firmly winding a tape T2 around the small tube portion 1 from outside. The frustoconical tube portion 2 is provided with a fitting recess 2a on the outer circular surface of its flared end portion, whilst the body panel 4 is provided with a through hole 4a. When mounting a set comprised of a grommet 3 and a wiring harness W/H in an automobile, the grommet 3 is passed through the hole 4a, so that the rim of the through hole 4a is fitted in the recess 2a.

When installing the set comprising a grommet 3 and a harness W/H in the through hole 4a of a body panel 4, it can be done either from the passenger space side or the engine side. In both cases, it is necessary to deform the frustoconical tube portion 2 when passing the grommet 3 through the hole 4a. The frustoconical tube portion 2 thus has a thinly constructed flaring portion 2b.

Noise generated in the engine compartment X (shown by arrows in Fig. 2) is transmitted through a thinner portion of the frustoconical tube portion 2 towards the inside of the grommet 3. The transmitted noise (shown by dotted arrows) passes therefrom through a space S formed between the external surface of the harness and the internal surface of the grommet, then into the passenger space Y.

The problem of noise-shielding has not been taken into account in the known grommet, so that the passenger space is rendered somewhat less comfortable because of this noise diffusing through the path hole of the harness.

To reduce the noise in the passenger space, it is proposed to fill the space S beforehand with a rigid material 6, as shown in Fig. 3. However, this rigid material renders the passing-through of the harness less manoeuvrable. Another possible method is to fill the space S with a sealing agent. However, the method adds on another working step, i.e. filling of the sealing agent.

Moreover, according to the above methods, the rigid material 6 or the solidified sealing agent prevents the grommet from deflecting, so that its passing through the body panel becomes difficult.

In addition, the wiring harness W/H becomes less flexible in the region where it passes through the grommet, so that the harness wiring in the car body also becomes more difficult. Accordingly, in the past, attempts to reduce the noise led to deteriorated workability, thus one realisation excluded the other.

The object of the present invention is therefore to provide a grommet having an improved acoustic performance and also a high workability without losing the flexure of the grommet and the flexibility of the wiring harness.

To this end, there is provided a grommet comprising: a small tube portion through which a wiring harness is passed and having an edge at one end thereof; a frustoconical tube portion flaring from the edge of the small tube portion and having a flared-out portion and an inner and outer surface, on the outer surface of the frustoconical tube portion there is formed a recess for fitting into a car body panel; an internal tube portion through which the wiring harness is passed, the internal tube portion depending from the edge of the small tube portion, extending substantially along the axial direction in the frustoconical tube portion and having an open edge and an outer surface; and a closing portion having a through hole being substantially centrally located, the closing portion being connected to the open edge of the internal tube portion and to the flared-out portion of the frustoconical tube portion, whereby there is provided a cross-sectionally circular closed space surrounded by the outer surface of the internal tube portion, the inner surface of the frustoconical tube portion and the closing portion.

The closing portion may have the shape of a disk with a central hole.

The closed space thus formed provides an air cushion. It absorbs the noise coming from the engine compartment through the wall of the frustoconical portion of the grommet, and reduces or suppresses the noise penetrating from the closed space into the passenger space. The air cushion thus improves the noise shielding. Further, the noise is shielded solely by virtue of providing a closed air cushion, so that the frustoconical tube portion retains the flexure. Further, the grommet is easily deformed when passing through the hole in the panel, so that it is easily mounted in the panel. As a consequence, the wiring harness passed through the grommet is kept flexible and the harness can be easily wired.

The grommet may be integrally formed from an elastic material. This material may be rubber or an elastomer.

The grommet may further comprise a flange portion for holding a dash silencer, the flange portion depending from the open edge of the internal tube portion. The

flange portion may comprise a tubular portion and an open end portion, the open end portion being radially outwardly bent. At least the internal tube portion and the closing portion are preferably formed of a high-density elastic material.

Such a high density material prevents noise penetration and improves the noise shielding. These two portions constitute a direct noise passage to the passenger space, hence the advantage to form these portions with a high-density material. The whole grommet can of course be manufactured with such a material. However, as the high-density material is expensive, such a construction will increase cost.

Preferably, the grommet comprises a plurality of internal wall portions which protrude longitudinally from the outer surface of the internal tube portion, so that the cross-sectionally circular closed space is partitioned into a plurality of sections.

The cross-sectionally circular closed space may further comprise an expanded material.

There is also provided a method of manufacturing the grommet, the method comprising the steps of:

a) integrally forming the small tube portion and the frustoconical tube portion in a mold in the presence of a vulcanising agent, whereby there is provided a grommet core part which is half vulcanised;
b) integrally forming the internal tube portion and the closing portion in another mold in the presence of a vulcanising agent, whereby there is provided a grommet sub-part which is half-vulcanised, the grommet core part and the grommet sub-part having corresponding binding sites;
c) putting the parts into a third mold, such that the corresponding binding sites are put into contact; and
d) heating the third mold until both parts become fully vulcanised, whereby the corresponding binding sites are melted and bound, to yield the grommet.

The method may further comprise the step of providing a flange portion for holding a dash silencer in the grommet sub-part. Preferably, the grommet sub-part is formed of a high-density material, whilst the grommet core part is formed of a lower-density material.

There is further provided a method of manufacturing the grommet, the method comprising the steps of:

a) integrally forming the small tube portion, the frustoconical tube portion and the internal tube portion in a mold in the presence of a vulcanising agent, whereby there is provided a grommet core part which is half-vulcanised;
b) forming the closing portion in another mold in the presence of a vulcanising agent, whereby there is provided a grommet sub-part which is half-vulcanised, the grommet core part and the grommet sub-part having corresponding binding sites;
c) putting both parts into a third mold, such that the corresponding binding sites are put into contact; and
d) heating the third mold until both parts become fully vulcanised, whereby the corresponding binding sites are melted and bound, to yield the grommet.

The method may further comprise the step of providing a flange portion for holding a dash silencer in the grommet sub-part. Preferably, the grommet sub-part is formed of a high-density material, whilst the grommet core part is formed of a lower-density material.

This grommet contains a closed space having a circular cross-section. Therefore, the methods need not contain a supplementary step of adding an anti-noise medium or a sealing agent, as is needed in the prior art. Production of the grommet is thus improved.

The above and other objects, features and advantages of the invention will be made apparent from the following description of the preferred embodiments, given as a non-limiting example, with reference to the accompanying drawings, in which:

Fig. 1 shows the site in an automobile where the grommet is mounted;
Fig. 2 shows a known grommet through which a wiring harness is passed; and
Fig. 3 shows a known grommet filled with a medium.
Fig. 4 shows the grommet according to a first embodiment of the present invention mounted in a car panel;
Fig. 5 shows a cross-section of the grommet after cutting along the line II-II in Fig. 4;
Fig. 6 schematically shows a manufacturing process of the grommet according to the first embodiment;
Fig. 7 schematically shows a manufacturing process of the grommet according to a second embodiment;
Fig. 8 shows the grommet according to a third embodiment, mounted in an automobile body panel;
Fig. 9 schematically shows a manufacturing process of the grommet according to the third embodiment;
Fig. 10 schematically shows a manufacturing process of the grommet according to a fourth embodiment;
Fig. 11 A shows a cross-sectional view of the grommet in Fig. 10 after cutting along the line A-A and Fig. 11 B after cutting along the line B-B;
Figs. 12 A, B and C schematically show a manufacturing process of the grommet according to a fifth embodiment.

Figs. 4 to 6 show a first embodiment of the grommet 10 of the invention. The grommet is integrally manufac-

tured in rubber or an elastomer. It comprises a small tube portion 11 through which the harness is passed and tightly held. It also comprises a frustoconical tube portion 12 which is connected to an edge 11a of the small tube portion and flares therefrom in a frustoconical shape. The flared end portion has a fitting recess 12a on its outer circular surface, to which recess is fitted the car body part. The grommet further comprises an internal tube portion 13 which extends from the edge 11a of the small tube portion along the axial direction of the frustoconical tube portion 12 and through which the harness is passed. The grommet further comprises a closing portion 14 having the form of a disk which radially extends outwardly from the edge 13a of the internal tube portion 13 at the end thereof remote from the small tube portion 11, and is connected to each of the flared edge 12b of the frustoconical tube portion 12 and the outer circular surface 13b of the internal tube portion 13. The latter outer surface 13b, the inner circular surface 12c of the frustoconical tube portion 12 and the inner face 14a of the closing portion 14 delimiting a closed space 16 of circular section.

The small tube portion 11 and the internal tube portion 13 have the same diameter and are linearly connected. Fig. 4 shows the case when the grommet is installed from the passenger space side towards the engine compartment. The wiring harness W/H is formed by grouping electrical cables W and bundling them by a tape T1. The harness is then passed through both portions and tightly held. The frustoconical tube portion 12 has a flaring portion 12d and a sectionally thick portion at the flared edge, on the outer circular surface of which is provided a panel-fitting recess 12a. The flared edge neighbouring the panel recess 12a extends radially outwardly and forms a fitting portion 12e behind the panel facing the passenger space Y. The panel-fitting recess 12a has a protrusion 12f on its base. As shown in Fig. 4, the rim of the through hole 4a formed in the body panel 4 is bent towards the engine compartment X, so as to form a ledged portion 4b. The above-mentioned protrusion 12f is abutted against the corresponding face of the ledged portion 4b.

The grommet 10 is manufactured as shown in Fig. 6. A grommet core part 20 comprised of a small tube portion 11 and a frustoconical tube portion 12 on the one hand, and a grommet sub-part 21 comprised of an internal tube portion 13 and a closing portion 14 on the other, are manufactured in separate molds (not shown in the figures) :a vulcanisable rubber is filled in the cavity of the molds and heated. The heating temperature of the molds and the vulcanisation temperature are adjusted depending on the type of rubber. When the grommet core part 20 and sub-part 21 are half-vulcanised (the surface becomes sticky), they are withdrawn from the molds.

Subsequently, the half-vulcanised core part 20 and sub-part 21 are put into another mold (not shown in the figures), such that the connecting sites of the core part 20 and those of the sub-part 21 are correspondingly placed. Those sites are the edge a of the small tube portion 11 against the edge b of the internal tube portion 11, on the one hand, and the edge c of the fitting portion 12e of the frustoconical tube portion 12 (to be located behind the panel facing the passenger space Y) against the corresponding surface d of the closing portion 14, on the other hand.

When the mold is closed and heated in this state, the connecting sites are fused and integrated to yield the grommet 10 shown in Fig. 4.

As can be seen, the space 16 closed by the internal tube portion 13, the frustoconical tube portion 12 and the closing portion 14 cannot be formed by one-step molding. On the other hand, the core part 20 and the sub-part 21 can be separately molded beforehand, up to a half-vulcanised state, then both are put into one common mold with the connecting sites arranged in the corresponding position. As both the parts 20, 21 are still in the half-vulcanised state, they can be integrated by further heating. This procedure enables to obtain an integrated piece of grommet made of rubber and having a closed space 16 of circular section.

In order to pass the wiring harness W/H through the grommet 10 and install them in a car, the small tube portion 11 and the internal tube portion 13 are first enlarged by a grommet-expanding machine (not shown in the figures). The wiring harness W/H, provided with a connector at its one end, is passed therethrough from the side of the connector. As the internal tube portion 13 is surrounded with an air cushion contained in the closed space 16, the tube portion 13 can make use of its flexural and elastic properties and can be easily expanded, so that the workability of the wiring harness W/H is not impeded.

Once the wiring harness W/H is passed through the grommet 10, the tape T2 is wound around the end portion distal to the frustoconical tube portion of the small tube portion 11 and part of the harness W/H is fixed therein (shown by dots and lines in Fig. 4). The wiring harness W/H is thus fixed in the grommet 10 at a predetermined position.

When the wiring harness W/H equipped with the grommet 10 is passed through a hole 4a in the body panel 4, this can be done from the engine compartment X to the passenger space Y, or vice versa, by deflecting the frustoconical tube portion 12 of the grommet 10. As the frustoconical tube portion 12 contains an air cushion in its closed space 16, it can be easily deflected. Then, the rim of the through hole 4a is fitted in the recess 12a of the frustoconical tube portion 12. The protrusion 12f is pressed by the ledged portion 4b, so that sealing is improved.

When noise occurs in the engine compartment X, the grommet 10 mounted in the panel 4 absorbs it by virtue of the air cushion contained in the closed space 16. Noise leakage is thus suppressed in the passenger space Y.

Fig. 7 shows a second embodiment. One different point with regard to the first embodiment is that the integrally-formed grommet core part 20' also comprises an internal tube portion 13, whilst the sub-part 21' comprises only the closing portion 14. Another difference is that the sub-part is formed of rubber made of a high-density material. To combine the grommet core part 20' and the sub-part 21', the end face 12b (referred to as c in Fig. 7) of the frustoconical tube portion 12 and a corresponding face of the closing portion 14 (referred to as d) are put into contact and heated in the mold.

When the closing portion 14 is made of a high-density material, noise permeability is further reduced and the noise shielding is further improved.

The high-density material may also be used for the sub-part 21 in the first embodiment.

Figs. 8 and 9 show a third embodiment. In this embodiment, the grommet 10 is mounted in the body panel 4 from the passenger space side and provided with a dash silencer on this side. The dash silencer flanks a noise-absorbing material 31 inside the panel and is defined by a wall 32 made of resin. They have a through hole 31a and 32a respectively, which are connected to the through hole 4a of the panel 4.

The grommet according to the third embodiment differs from that of the first embodiment in that a dash-silencer holding means 23 is provided in an extension of the end face of the internal tube portion 13. This holding means has a thrusting tube portion 24 extending from the end face 13a, as well as a stopper flange 25 bent outwardly from the end portion of the thrusting tube portion 24. The latter traverses through the hole 31a of the noise-absorbing material 31, whilst the stopper flange 25 is passed through the hole 32a of the wall 32 and held thereby.

Fig. 9 shows a grommet 10 provided with a dash-silencer stopper flange 23. The grommet core part 20 constructed as in the first embodiment on the one hand and the sub-part 21 comprising the stopper flange 23, the internal tube portion 13 and the closing portion 14 on the other hand, are respectively molded in a different mold until they become half-vulcanised. Then, they are put into one mold, with the sites to be bound in corresponding position, and molded, so that the two parts are integrally formed. Preferably, the sub-part 21 equipped with the stopper flange 23 is made of a high-density rubber.

Figs. 10 and 11 show a fourth embodiment. As a different point vis-à-vis the first embodiment, the internal tube portion 13 of the sub-part 21 is provided with partitioning wall portions 26. These wall portions protrude longitudinally from the circular outer surface of the internal tube portion 13 at 90° from one another. One end of the partitioning wall portions 26 is bound to a corresponding face of the closing portion 14. This sub-part 21 is combined with the grommet core part 20 and molded, so that the rim section 26a of each partitioning wall portion 26 and the inner surface 12c of the frustoconical tube portion 12 are integrally bound.

Fig. 11 B shows the above-mentioned fourth embodiment. In this embodiment, the space formed by the internal tube portion 13, the frustoconical tube portion 12 and the closing portion 14 is separated into four closed spaces 16a, 16b, 16c, 16d by partitioning walls 26.

When the internal tube portion 13 and the frustoconical tube portion 12 are connected by the partitioning walls 26, the latter may be prevented from heat deformation and more firmly installed into the body panel.

Fig. 12 shows a fifth embodiment. As shown in Fig. 12 A, the grommet core part 20 is formed in a mold to give a half-vulcanised product. Then, as shown in Figure 12 B, a resin-foam paint 28 is applied to the inner circular surface 12a of the frustoconical tube portion 12 to a predetermined thickness. Subsequently, this is put into a mold together with a sub-part comprising an internal tube portion 13 and a closing portion 14, and heated. As shown in Fig. 12 C, the applied paint 28 is inflated up to the outer circular surface of the internal tube portion 13, so that the closed space 16 formed by the above three portions becomes filled with an expanded material 28'. This material absorbs noise and improves the noise insulation of the grommet.

As to the wiring harness W/H passed through the grommet, a sealing product, such as urethane, can be applied from the side of the small tube portion. It can thus fill the air gap between electrical cables W of the harness W/H located in the small tube portion.

As is apparent from the above description, the grommet of the present invention is provided with a closed space formed by shutting the flared end of frustoconical tube portion. This grommet may be mounted into the panel, for example, from the passenger space side. In that case, the noise formed in the engine compartment enters into the flared wall of the frustoconical tube portion and penetrates towards the opening thereof on the passenger space side. The closed space absorbs this noise by its air cushion and reduces or suppresses the passage of the noise towards the passenger space side.

Further, the grommet of the invention is provided with an anti-noise, closed space and comprises no medium nor solid sealing agent. The frustoconical tube portion can thus be easily deflected and the grommet is easily mounted into the through hole of the body panel. As a result, noise shielding and workability are both improved. Moreover, the anti-noise grommet with such a closed space can be manufactured with rubber or an elastomer as an integral piece. Thus, the grommet is easily manufactured, without supplementary work of installing an anti-noise medium or seal. Productivity for grommet manufacturing is also enhanced.

In automobiles, it is very important to prevent the noise from entering into the passenger space and thus render its living space more comfortable. To this end, noise leakage from the engine has to be reduced or sup-

pressed. The grommet according to the invention practically suppresses low noise and lowers high noise. The noise leakage towards the passenger space is thus prevented or suppressed, so that the latter is rendered more comfortable.

Claims

1. A grommet (10) comprising: a small tube portion (11) through which a wiring harness (W/H) is passed and having an edge (11a) at one end thereof; and a frustoconical tube portion (12) flaring from said edge (11a) of said small tube portion (11) and having a flared-out portion and an inner (12c) and outer surface, on the outer surface of the frustoconical tube portion (12) there is formed a recess (12a) for fitting into a car body panel, characterised in that said grommet (10) further comprises an internal tube portion (13) through which said wiring harness (W/H) is passed, said internal tube portion (13) depending from said edge (11a) of the small tube portion (11), extending substantially along the axial direction in said frustoconical tube portion (12) and having an open edge (13a) and an outer surface (13b); and a closing portion (14) having a through hole being substantially centrally located, said closing portion (14) being connected to said open edge (13a) of the internal tube portion (13) and to said flared-out portion of said frustoconical tube portion (12), whereby there is provided a cross-sectionally circular closed space (16) surrounded by said outer surface (13b) of said internal tube portion (13), said inner surface (12c) of said frustoconical tube portion (12) and said closing portion (14).

2. The grommet (10) according to claim 1, being integrally formed in an elastic material.

3. The grommet (10) according to claim 1 or 2, further comprising a flange portion (23) for holding a dash silencer, said flange portion (23) depending from said open edge (13a) of the internal tube portion (13).

4. The grommet (10) according to claim 3, wherein said flange portion (23) comprises a tubular portion (24) and an open end portion(25), said open end portion (25) being radially outwardly bent.

5. The grommet (10) according to any one of claims 1 to 4, wherein at least said internal tube portion (13) and said closing portion (14) are formed in a high-density elastic material.

6. The grommet (10) according to any one of claims 1 to 5, further comprising a plurality of internal wall portions (26) protruding longitudinally from said outer surface (13b) of said internal tube portion (13), whereby said cross-sectionally circular closed space(16) is partitioned into a plurality of sections.

7. The grommet (10) according to any one of claims 1 to 6, wherein said cross-sectionally circular closed space (16) further comprises an expanded material (28').

8. A method of manufacturing the grommet (10) according to any one of claims 2 to 7, characterised in that said method comprises the steps of:

   a) integrally forming said small tube portion (11) and said frustoconical tube portion (12) in a mold in the presence of a vulcanising agent, whereby there is provided a grommet core part (20) which is half-vulcanised;
   b) integrally forming said internal tube portion (13) and said closing portion (14) in another mold in the presence of a vulcanising agent, whereby there is provided a grommet sub-part (21) which is half-vulcanised, said grommet core part (20) and said grommet sub-part (21) having corresponding binding sites;
   c) putting said parts into a third mold, such that said corresponding binding sites are put into contact; and
   d) heating said third mold until said parts become fully vulcanised, whereby said corresponding binding sites are melted and bound to yield said grommet (10).

9. The method according to claim 8, said method further comprising the step of providing a flange portion (23) for holding a dash silencer in said grommet sub-part (21).

10. The method according to claim 8 or 9, wherein said grommet core part (20) is formed of a low-density material and said grommet sub-part (21) is formed of a high-density material.

11. A method of manufacturing the grommet (10) according to any one of claims 2 to 7, characterised in that said method comprises the steps of:

   a) integrally forming said small tube portion (11), said frustoconical tube portion (12) and said internal tube portion (13) in a mold in the presence of a vulcanising agent, whereby there is provided a grommet core part (20') which is half-vulcanised;
   b) forming said closing portion (14) in another mold in the presence of a vulcanising agent, whereby there is provided a grommet sub-part (21') which is half-vulcanised, said grommet core part (20') and said grommet sub-part (21')

having corresponding binding sites;
c) putting said parts into a third mold, such that said corresponding binding sites are put into contact; and
d) heating said third mold until said parts become fully vulcanised, whereby said corresponding binding sites are melted and bound to yield said grommet (10).

12. The method according to claim 11, said method further comprising the step of providing a flange portion (23) for holding a dash silencer in said grommet sub-part (21').

13. The method according to claim 11 or 12, wherein said grommet core part (20') is formed of a low-density material and said grommet sub-part (21') is formed of a high-density material.

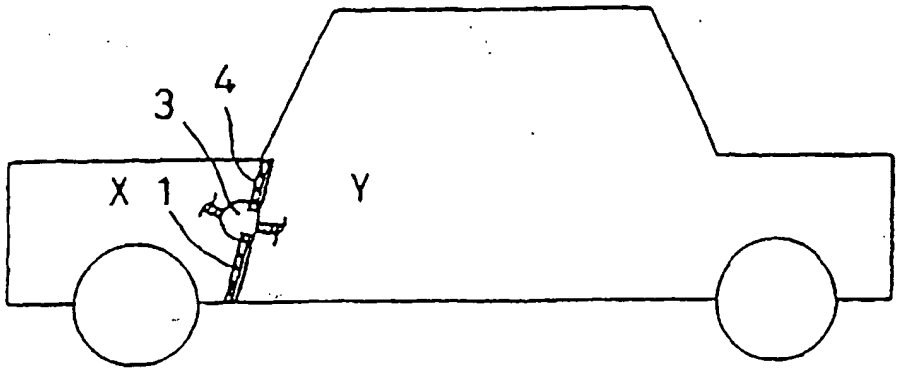

FIG.1 - PRIOR ART

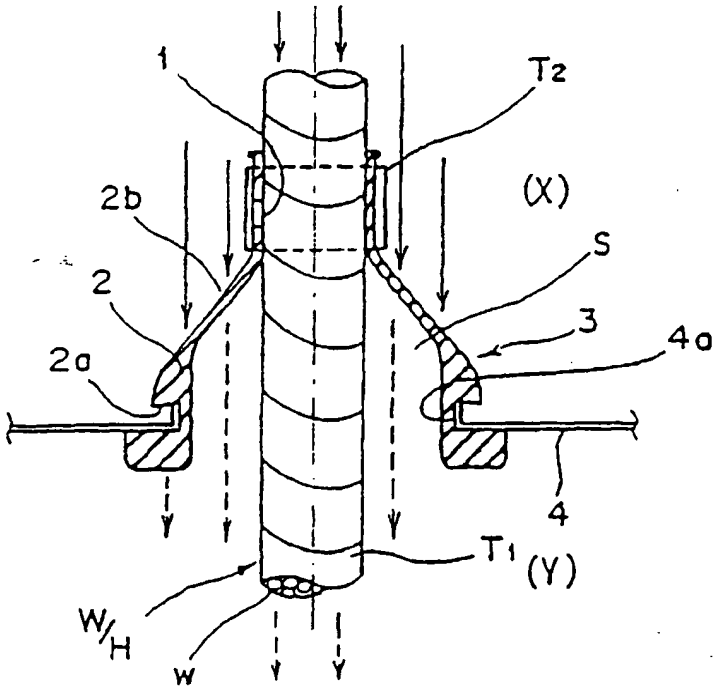

FIG.2 - PRIOR ART

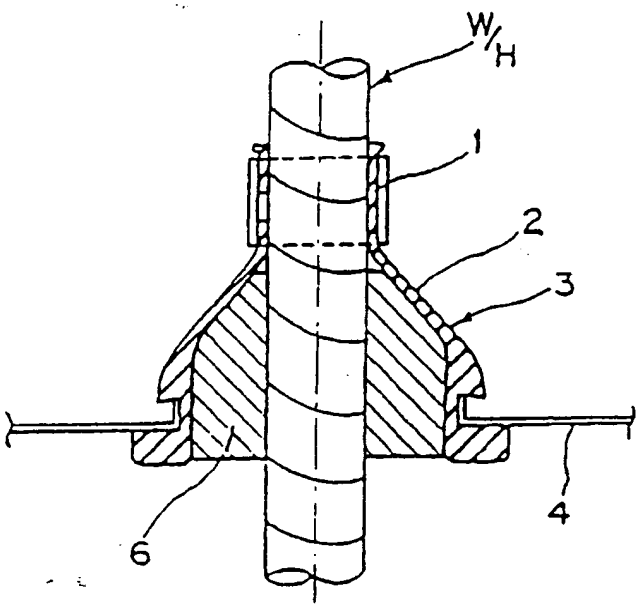

FIG.3 - PRIOR ART

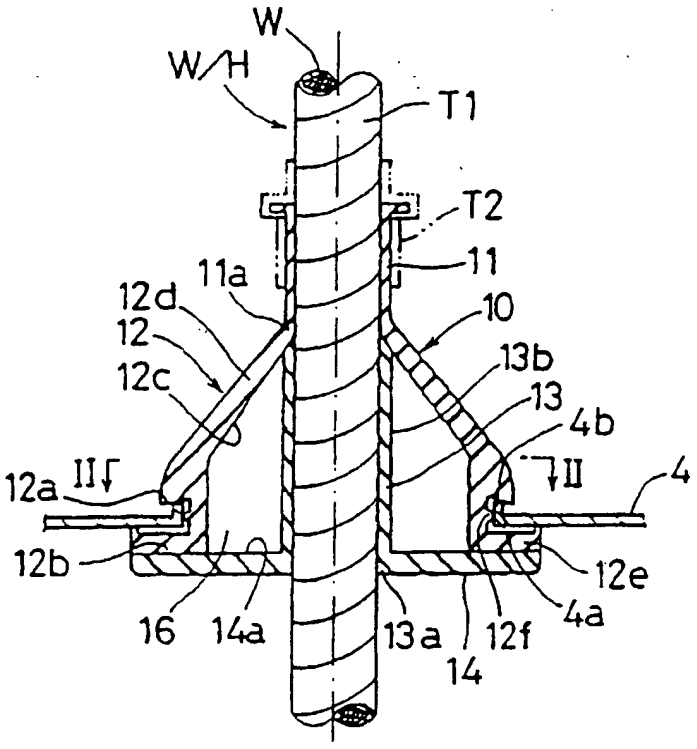
W
W/H
T1
T2
11
11a
12d
12
12c
10
13b
13
4b
12a
II
II
4
12b
12e
4a
16
14a
13a
12f
14

FIG.4

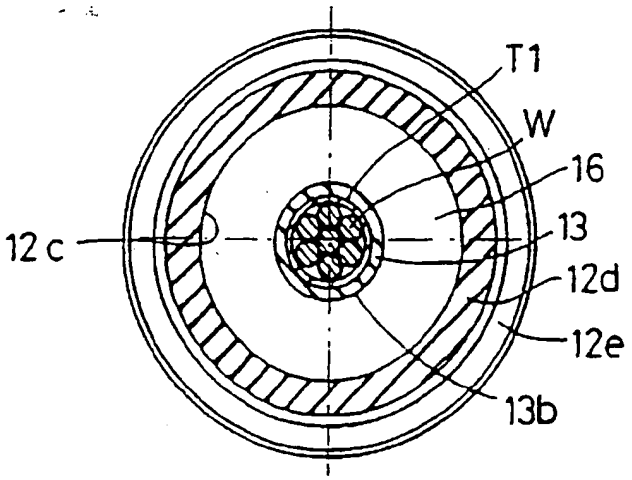
T1
W
16
12c
13
12d
12e
13b

FIG.5

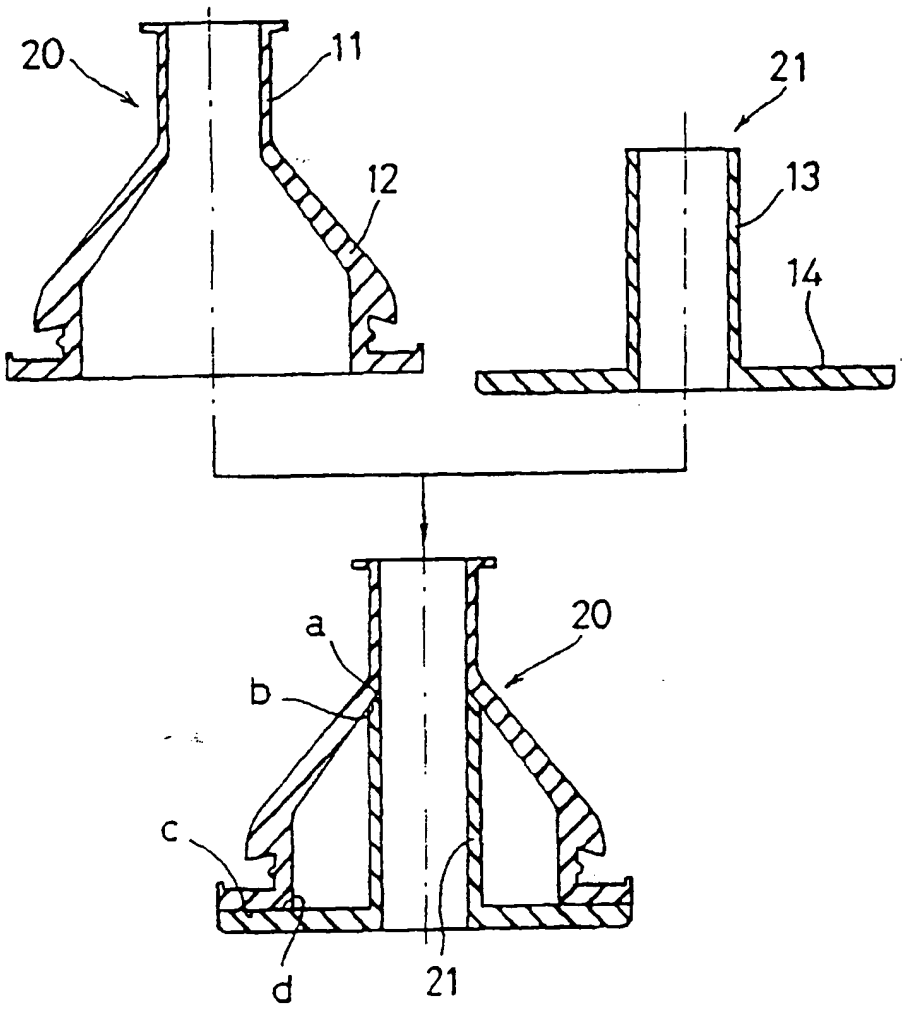

FIG.6

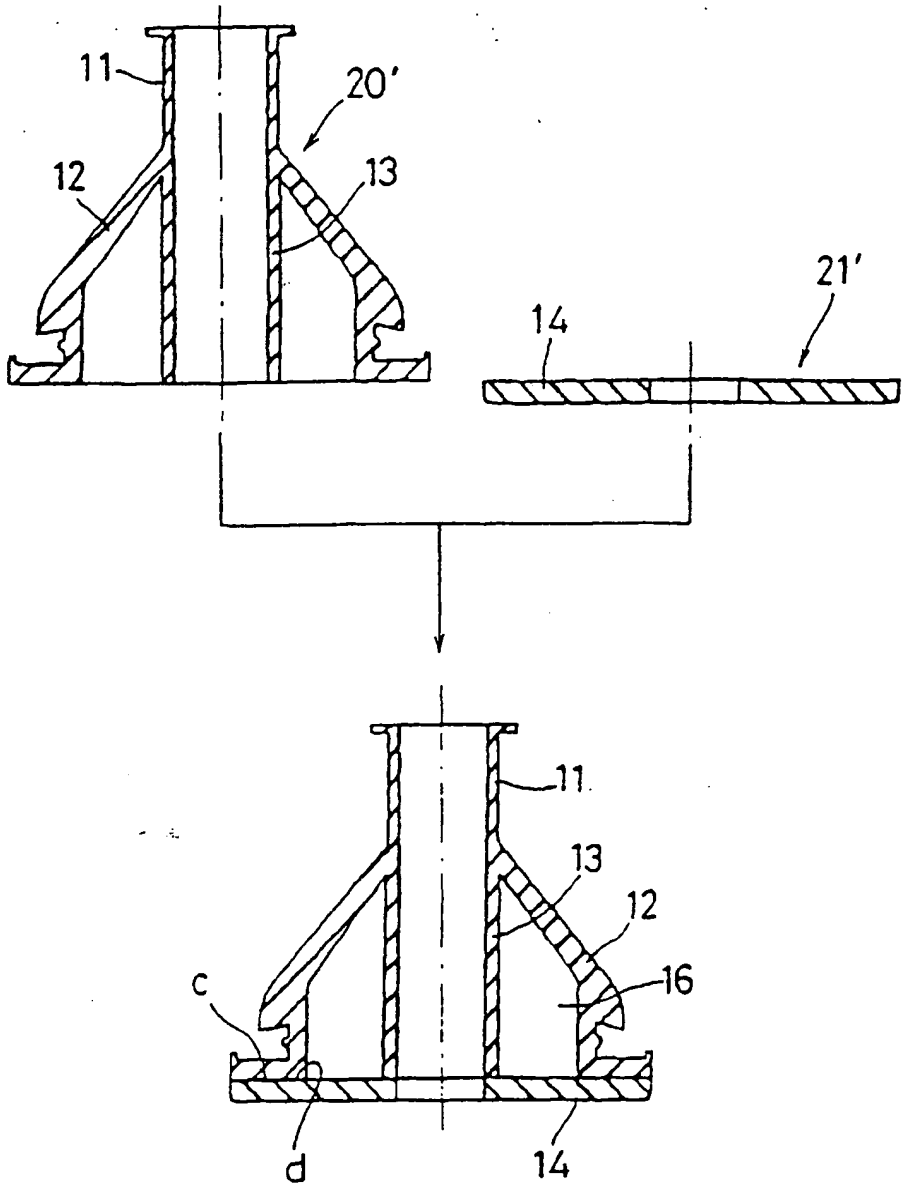

FIG.7

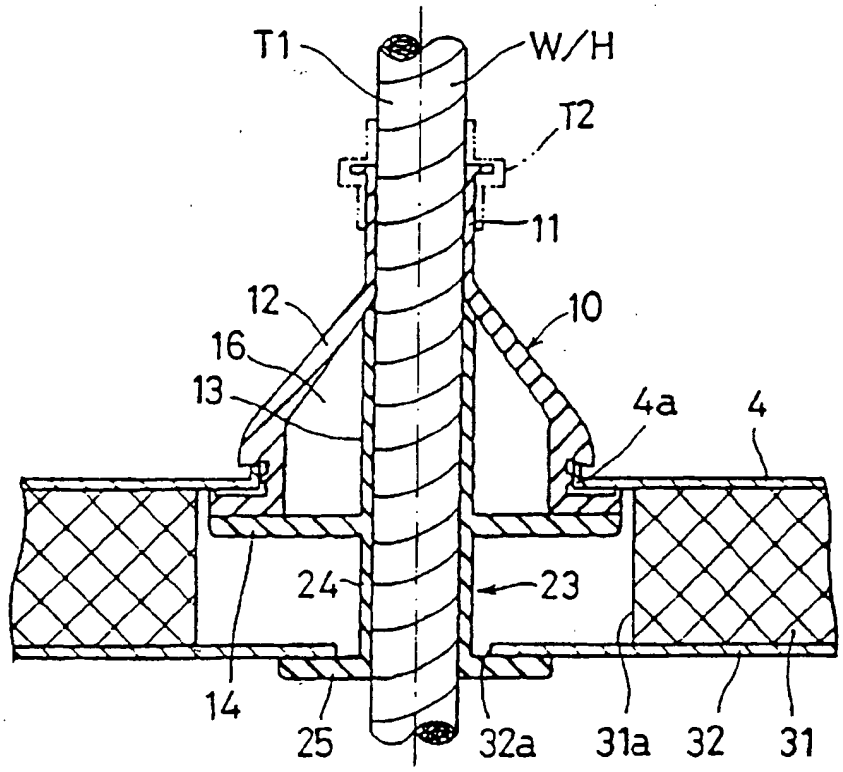

FIG.8

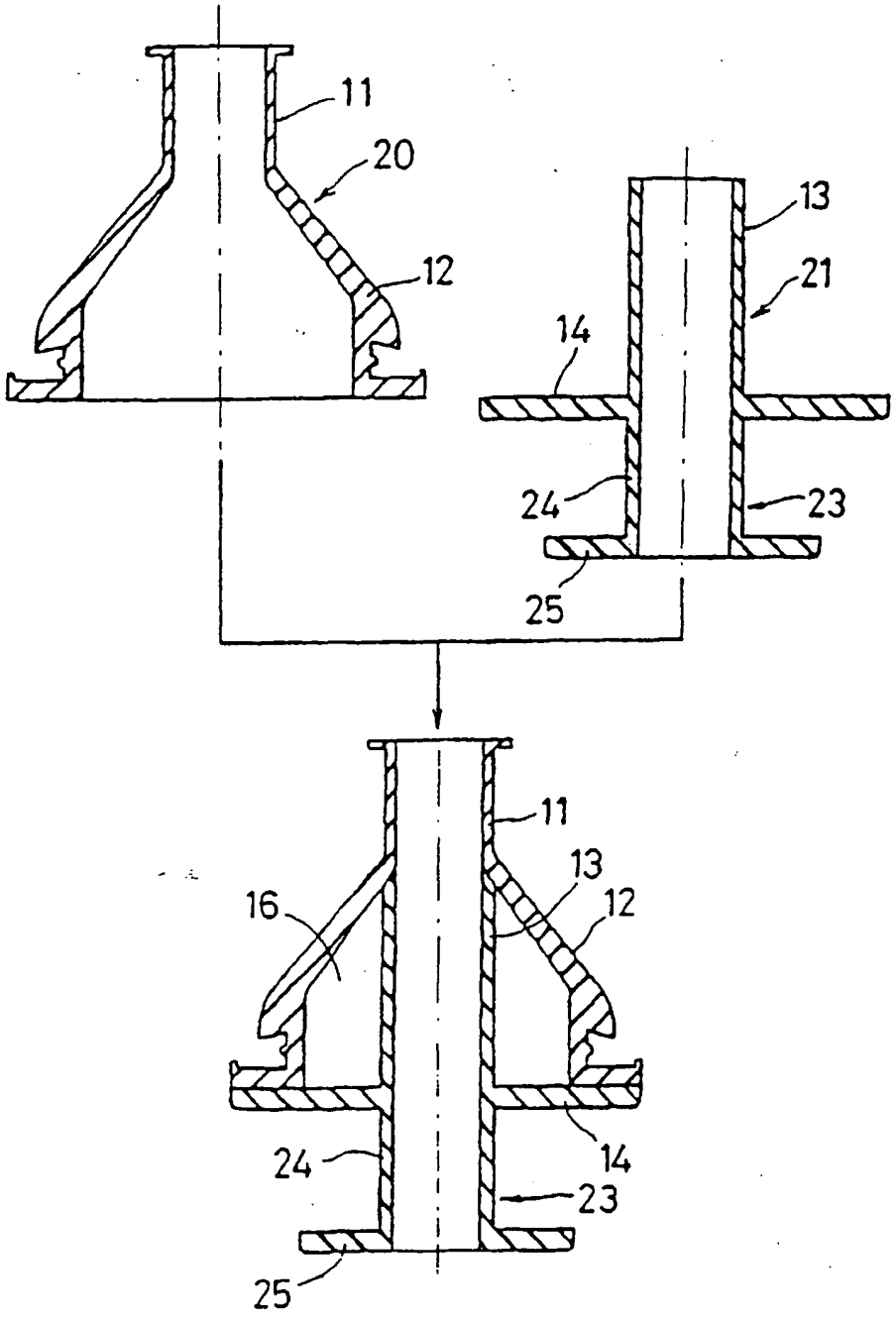

FIG.9

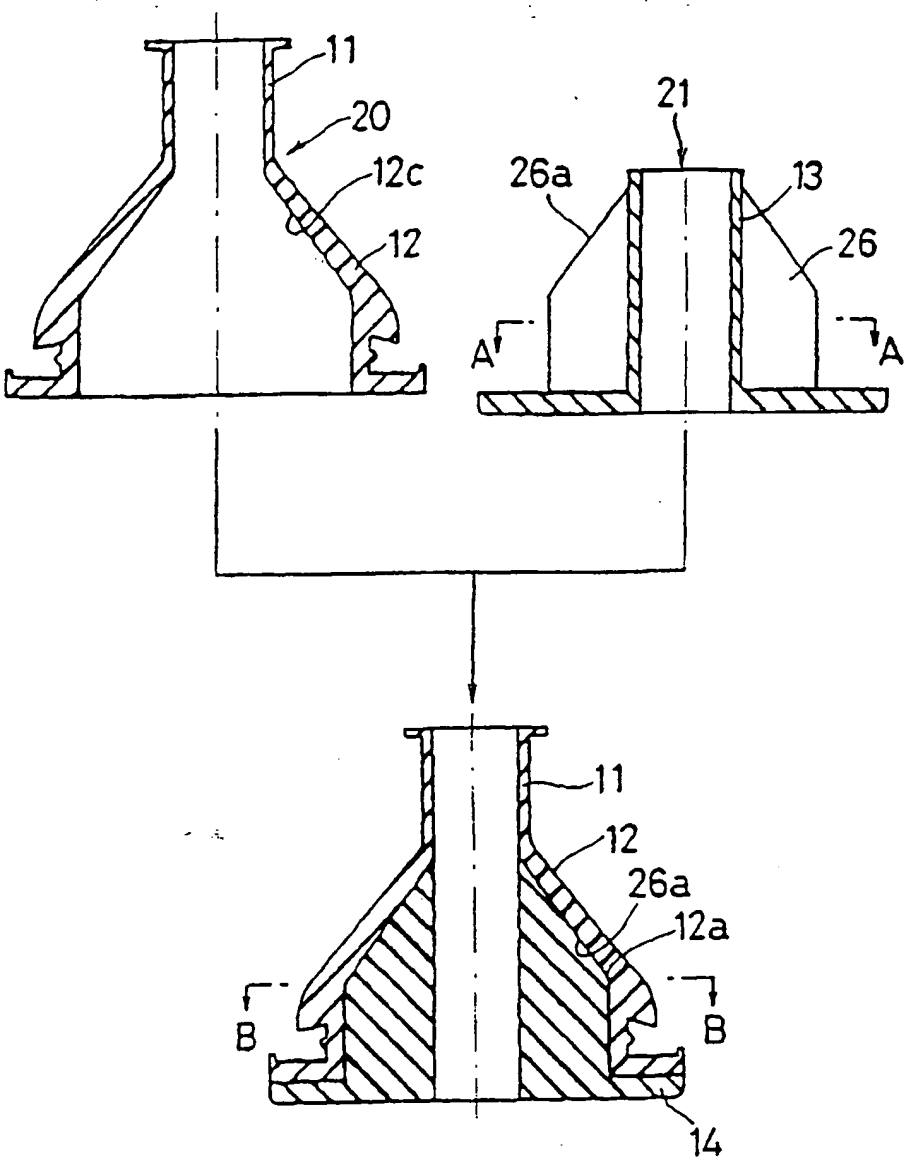

FIG.10

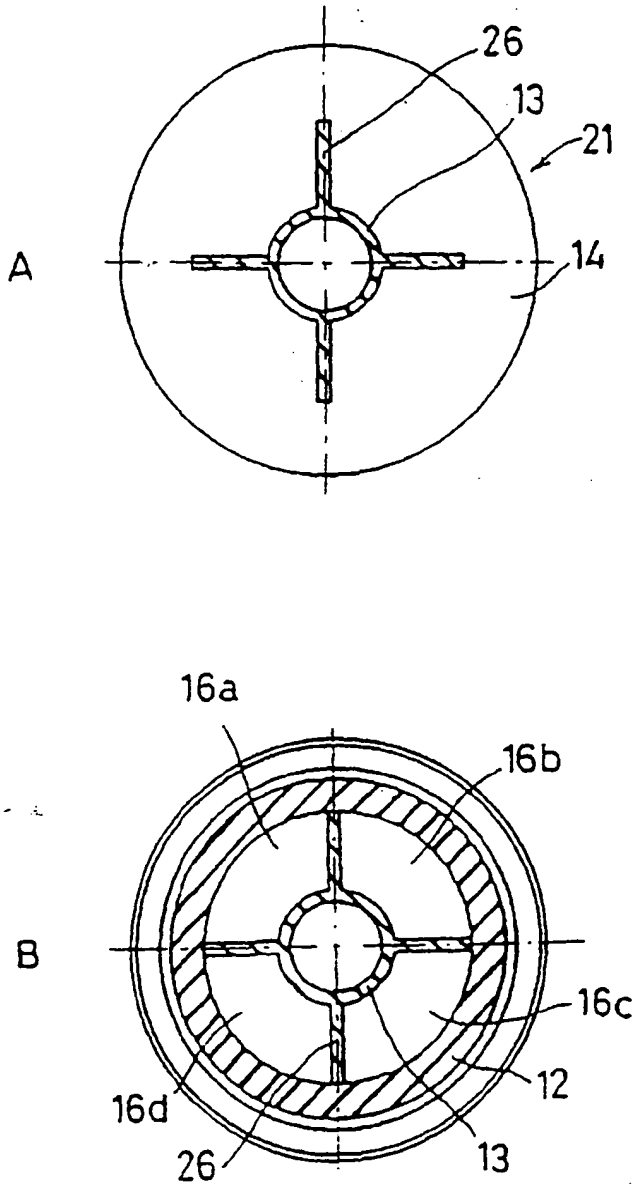

FIG.11

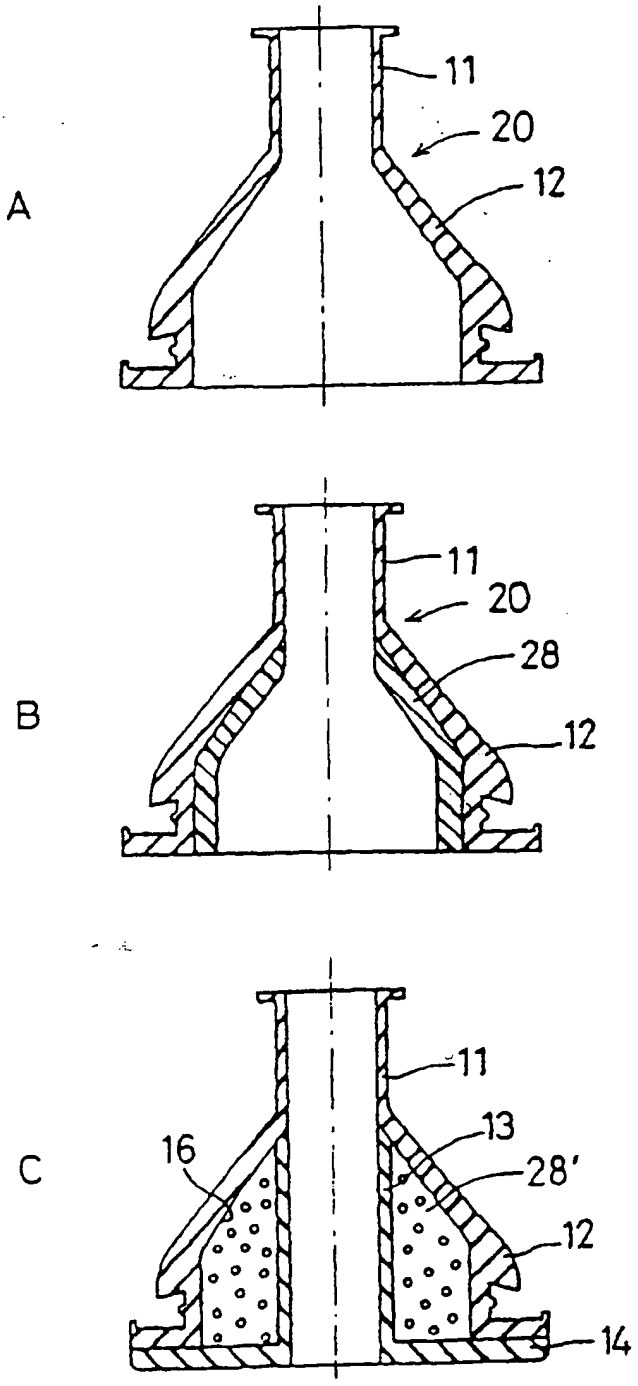

FIG.12

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 822 121 A3

(12) EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
07.07.1999 Bulletin 1999/27

(43) Date of publication A2:
04.02.1998 Bulletin 1998/06

(21) Application number: **97401841.8**

(22) Date of filing: **31.07.1997**

(51) Int Cl.[6]: **B60R 16/02**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV RO SI

(30) Priority: **01.08.1996 JP 20361296**

(71) Applicant: **SUMITOMO WIRING SYSTEMS, LTD.**
Yokkaichi City Mie 510 (JP)

(72) Inventors:
- **Sakata, Tsutomu**
  Yokkaichi-City, Mie 510 (JP)
- **Kato, Takahiro**
  Yokkaichi-City, Mie 510 (JP)

(74) Representative: **Bertrand, Didier et al**
Cabinet FEDIT-LORIOT
38, Avenue Hoche
75008 Paris (FR)

(54) A noise-preventive grommet and a manufacturing process of the same

(57) Used in an automobile, the grommet (10) reduces noise leakage from the engine to the passenger space. It is made of rubber or an elastomer and comprises : a small tube portion (11), through which a wiring harness (W/H) is passed ; a frustoconical tube portion (12) flaring from an edge (11a) of the small tube portion (11) and comprising a flared portion, on the outer surface of which is formed a recess (12a) for fitting car body panel ; an internal tube portion (13) through which the wiring harness (W/H) is passed, the internal tube portion (13) depending from the edge (11a) of the small tube portion (11) and extending along the axial direction in the frustoconical tube portion (12) ; and a closing portion (14) connected to an edge (13a) of the internal tube portion (13) distal to the edge (11a) of the small tube portion (11) and to the flared portion.

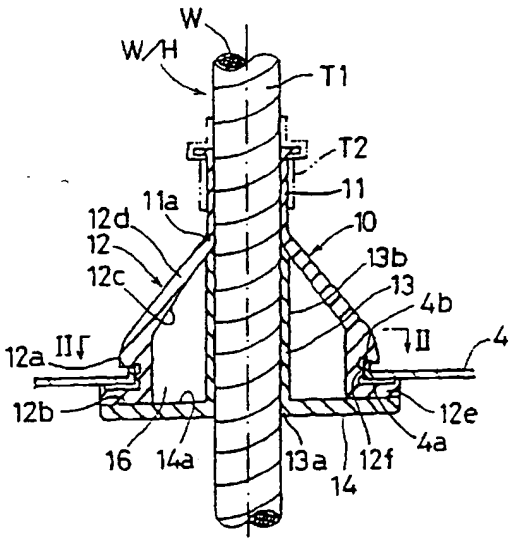

FIG.4

EP 0 822 121 A3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 40 1841

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	GB 2 289 104 A (SUMITOMO WIRING SYSTEMS ;INOUE MTP KK (JP)) 8 November 1995 * page 7, line 4 - page 10, line 8 * * page 15, line 19 - page 28, line 14; figures 1,7-20 *	1-13	B60R16/02
A	US 5 499 823 A (FUKUI TAKAAKI) 19 March 1996 * the whole document *	2,6,7	
A	US 4 685 173 A (PAVUR CAROL P) 11 August 1987 * the whole document *	2	
A	GB 2 259 343 A (SUMITOMO WIRING SYSTEMS) 10 March 1993 * the whole document *	2,7	
A	EP 0 580 130 A (ICHIKO INDUSTRIES LTD ;SHIBA SEISAKUSHO YK (JP)) 26 January 1994 * the whole document *	1,2,5	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A	FR 2 678 705 A (MECANISMOS AUX IND) 8 January 1993 * figure 2 *	3,4	B60R H02G H01B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14 May 1999	Geyer, J-L

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 97 40 1841

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

14-05-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2289104 A	08-11-1995	JP 7296660 A	10-11-1995
		JP 8251770 A	27-09-1996
		US 5739475 A	14-04-1998
		EP 0731000 A	11-09-1996
		US 5856635 A	05-01-1999
US 5499823 A	19-03-1996	JP 7228208 A	29-08-1995
US 4685173 A	11-08-1987	NONE	
GB 2259343 A	10-03-1993	JP 2643678 B	20-08-1997
		JP 5062551 A	12-03-1993
		US 5270487 A	14-12-1993
EP 0580130 A	26-01-1994	JP 6038339 A	10-02-1994
		JP 6038340 A	10-02-1994
FR 2678705 A	08-01-1993	ES 2097676 A	01-04-1997
		US 5608191 A	04-03-1997
		DE 4208762 A	07-01-1993
		PT 100287 A	29-04-1997
		FR 2676994 A	04-12-1992
		PT 99115 A	31-01-1994

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82